Fourth Semester MCA Degree Examination, Dec.2016/Jan.2017
Design and Analysis of Algorithms

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1   a.   Write an algorithm for GCD of 2 numbers using Euclid's algorithm, with example.
                                                                        (10 Marks)
      b.   Explain briefly (i) Time efficiency (ii) Space efficiency   **(04 Marks)**
      c.   Write an algorithm for Brute force pattern matching.   **(06 Marks)**

2   a.   What is divide and conquer technique? Write an algorithm for divide and conquer technique.
                                                                        (08 Marks)
      b.   Find the time complexity for merge sort using the recurrence relation.
$$T(n) = T(n/2) + T(n/2) + 2$$
                                                                   (12 Marks)

3   a.   Obtain the optimal solution for the job sequencing problem. Given the following jobs, profits and their deadlines.

i	1	2	3	4
Pi	100	10	15	27
di	2	1	2	1

                                                                       (10 Marks)
      b.   Write an algorithm for single source shortest path using Dijkstra's with an example.
                                                                   (10 Marks)

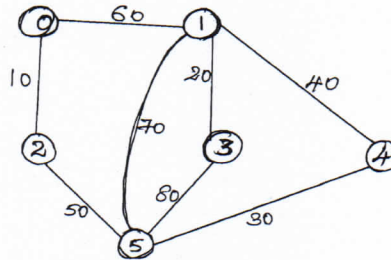4   a.   Solve the following graph in Fig.Q4(a), using Prim's algorithm to find minimum spanning tree.   **(10 Marks)**

Fig.Q4(a)

      b.   Solve the knapsack problem using dynamic programming with capacity M = 5.

Item	Weights	Profits
1	2	12
2	1	10
3	3	20
4	2	15

                                                                       (10 Marks)

5   a.   Explain decrease and conquer. Also explain the three variations of decrease and conquer technique.   **(08 Marks)**
      b.   Sort the elements of 25 75 40 10 20 using insertion sort.   **(08 Marks)**
      c.   Explain in short about Graph Traversals.   **(04 Marks)**

6 a. Explain in detail about sorting by counting. **(10 Marks)**
    b. Write an algorithm for Horspool's - pattern - matching with example. **(10 Marks)**

7 a. Obtain the decision tree to find minimum of three numbers. **(05 Marks)**
    b. Define P, NP and NP-complete problems. **(06 Marks)**
    c. Define sum of subject problem. Construct the state-space tree for sum of subset problem, given the following data: $W = \{ 3, 5, 6, 7 \}$ and $M = 15$. **(09 Marks)**

8 a. Explain Sequential and Parallel classification algorithms in brief. **(08 Marks)**
    b. What is prefix computation problem? Let Σ be the set of integers.
        i) $\oplus$ is the usual addition operation. The input to the prefix computation problem is : $3, -5, 8, 2, 5, 4$. Obtain the prefixes.
        ii) $\oplus$ is the usual multiplication operation. The input to the prefix computation problem is : $2, 3, 1, -2, -4$. Obtain the prefixes. **(12 Marks)**

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